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AUTSKED: REVISITED

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ABSTRACT

AUTSKED is a FORTRAN program created to automate scheduling of leaching and oil filling of salt caverns at the Strategic Petroleum Reserve. There have been a number of revisions to the AUTSKED program since the first version. This report documents the latest embellishments to the program.

DISCLAIMER OF WARRANTY

This program is presented without any express or implied warranties whatsoever. Because of the diversity of conditions and hardware under which this program may be used, no warranty of fitness for a particular purpose is offered. The user is advised to test the program thoroughly before relying upon it. The user must assume the entire risk of using the program.

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I. INTRODUCTION

The purpose of this report is to describe the latest set of changes and additions to the AUTSKED program. The original AUTSKED program was documented in a Sandia National Laboratories (SNL) report published in March, 1984.[1] After the program was in use for several months, the AUTSKED user community requested several additional features. These additional features were implemented and subsequently documented in an SNL report published in April, 1985.[2] During the year 1986, more requests for modifications to AUTSKED were made. This report documents the implementation of most of these requests. A detailed discussion of these modifications is found in Section III.

AUTSKED is used in conjunction with two other SNL created programs, EDITOR and PREDICT.[3] Previously, these three programs had been executed separately, each one providing output to be used by the others. Now, the three programs AUTSKED, EDITOR, and PREDICT, have been incorporated as subprograms of a single program, SPRSKD. AUTSKED also uses a FORTRAN software package called Simulation Language for Alternative Modeling (SLAM), which is described in Section IV.[5,6]

AUTSKED, EDITOR and PREDICT are FORTRAN programs, written in ANSI standard FORTRAN 77. It is the author's understanding that the currently available version of SLAM (SLAM II) is also written in ANSI standard FORTRAN 77. Thus, there should not be much difficulty in adapting these programs to other computers which have a FORTRAN 77 compiler. Efforts have been made to ensure that the FORTRAN statements in AUTSKED, EDITOR and PREDICT do not depend on word size, which varies from computer to computer. There are no mathematical calculations in any of these programs which require high precision.

II. PROGRAM STRUCTURE

In this section an overview of the program structure and operation is presented. The program is highly interactive, requiring decisions and input by the user for each of the three subprograms EDITOR, PREDICT and AUTSKED. In this discussion, as well as in the program itself, it is assumed that the user is knowledgeable about the various stages in cavern development as described in References 1 and 3.

A program flow diagram is displayed in Figure 2.1. At program start, the user is given the following four choices:

1. Edit old site file or create new site file using EDITOR
2. Develop individual cavern schedules using PREDICT
3. Develop site schedule using AUTSKED
4. Exit from program

Option 4 needs no explanation. The other options will be discussed in more detail.

EDITOR is an interactive FORTRAN subprogram which guides the user through a sequence of interrogations to create a new site file or to edit an existing or old site file. The user is asked for a file name which is restricted to eight or fewer alphanumeric characters, the first of which must be alpha. The site file contains characteristics of the Strategic Petroleum Reserve (SPR) site, the number of caverns, present state of each cavern, desired leaching processes, days of workover, brine production schedules, stage end volumes, etc. This file is used as input to PREDICT. In editing an old site file, these various attributes can be changed for each individual cavern. The edited file can replace the old file or it can be given a new name. In creating a new site file, the user can input the requested information for each cavern. Alternatively, the user can input this information for one cavern, and this becomes the default data for all subsequent caverns of the site. Individual caverns may then be edited as desired.

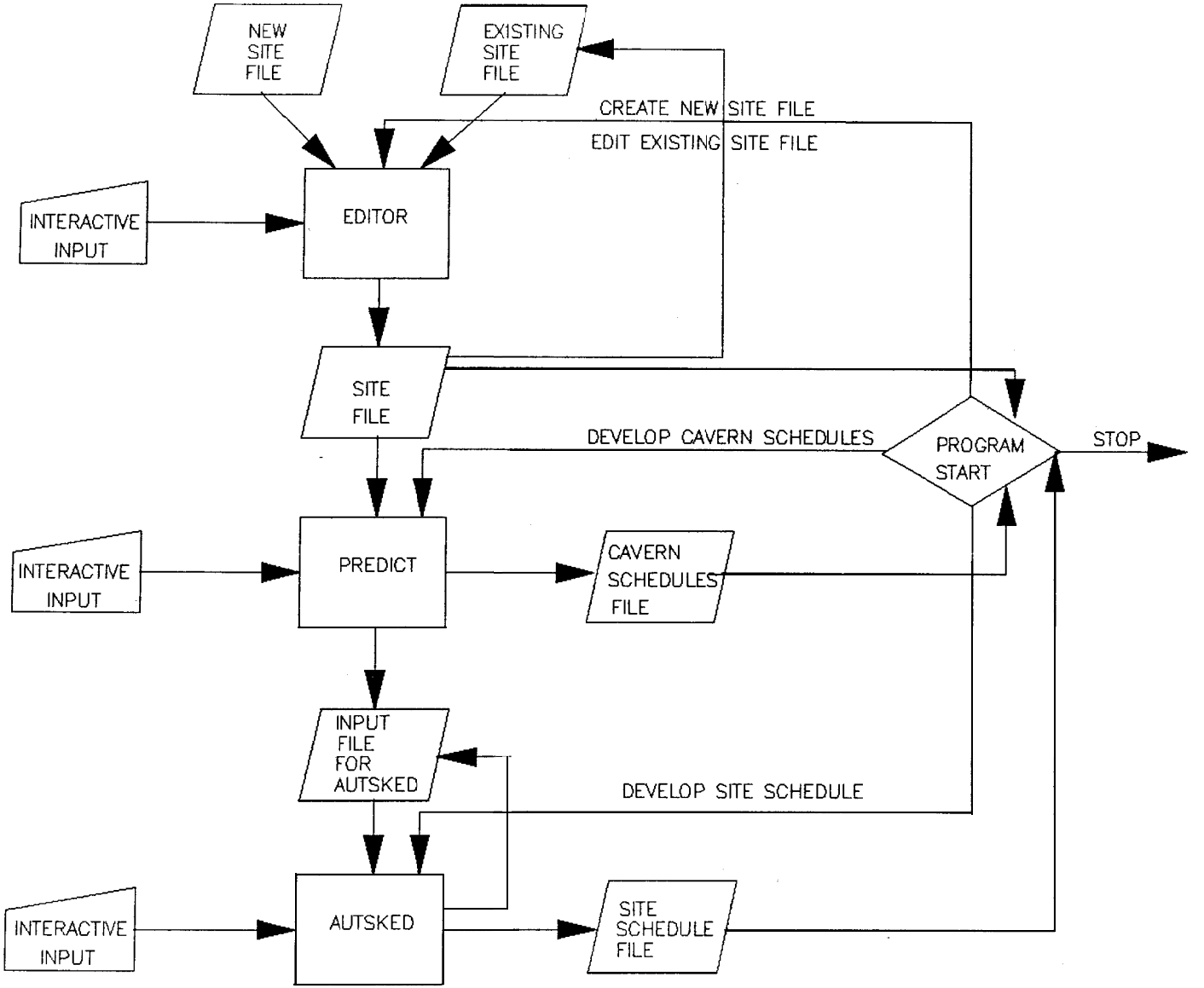


Figure 2.1. Program Flow Diagram

PREDICT is also an interactive FORTRAN subprogram which requires for input a file created by EDITOR. The user is requested to provide the name of this file. PREDICT uses the information in the EDITOR site file to develop individual cavern schedules for each cavern at a site. These schedules are created based upon predicted leaching efficiencies as a function of brine production flow rates. The scientific support for these leaching efficiencies is described in Reference 4. The important thing to observe here is that PREDICT produces individual cavern schedules independent of any constraints such as brine disposal capability, oil availability, equipment available for workovers, etc. These schedules are meaningful only if all caverns at a site can be developed simultaneously, which is not possible. Thus, AUTSKED was developed to cope with this problem.

There are two output files generated by PREDICT. One is a listing of the individual cavern schedules and the second is used as an input file for AUTSKED. The user is asked for a name for the first file, or instructed that the default option is a listing at the user's terminal. The user is also instructed to insert a name for the file to be used as an input to AUTSKED.

AUTSKED is another interactive FORTRAN subprogram which requires for input a file created by PREDICT. The user is requested to provide the name of this file. AUTSKED uses the individual cavern schedules created by PREDICT and, along with a cavern priority ranking, creates a site schedule subject to the following constraints:

1. Maximum allowable brine flow from a site
2. Maximum allowable oil flow to a site
3. Maximum allowable brine flow from each cavern
4. Maximum allowable oil flow to each cavern
5. Number of workover rigs available

The critical element in this site schedule development is the cavern priority ranking. The original version of AUTSKED[1] made an attempt to

find a dynamic cavern prioritization scheme which would minimize the time for completion of a site. The site-scheduling problem is a specific instance of the general problem of activity scheduling with resource allocation constrained by limited resource availability. There are no methods known for optimally solving this problem. In Reference 1 several heuristic methods were examined, one of which appeared to be superior over the others. This scheme was referred to in Reference 1 as "shortest time remaining (STR)." In site-scheduling terminology, at each breakpoint, caverns are prioritized according to the time needed to complete the cavern's development (leaching and oil filling), with the cavern having the shortest time to completion being given first priority, the next shortest having second priority, etc. This cavern prioritization is one of the options available in AUTSKED. The other prioritization option is for the user to provide an initial ranking of caverns. Previously this user-ranking of caverns persisted throughout the site development. The current version of AUTSKED allows some flexibility in changing cavern rankings during site development. Section III discusses this further.

The output file of AUTSKED (name of file is requested of the user> contains the site schedule. Two user-selected options for additional information in this file are:

1. A tabulation, at each breakpoint and for each cavern, of the current cavern and oil volume and, at each breakpoint, a site total cavern and oil volume.

2. A "clock" for each cavern which displays at each breakpoint the accumulated number of days the cavern was in active development or was idle (zero brine flow rate, as scheduled by PREDICT). This "clock" time does not include time during which the cavern was idle because AUTSKED did not schedule it due to brine flow, oil flow or workover constraints.

Option 1 is self-explanatory. Option 2 is clarified in Section III.

III. NEW FEATURES IN AUTSKED

This section describes the latest embellishments to AUTSKED. There were eight changes requested for AUTSKED which became the basis of modifications made in the program. These requested changes are stated below, followed by a discussion of how they were or why they were not implemented.

1. Permit the user to specify the oil/water ratio in leach/fill mode.

   In the leach/fill mode of cavern development, cavern leaching and oil filling occur simultaneously during some stages of development. Previously, the oil/water ratio during these stages was determined from SANSMIC predictions.[4] This has been changed so that the user can either implement the SANSMIC ratios or specify different ratios. Implementation has been made in the form of an option in the interactive input to PREDICT (see Figure 2.1). There are no restrictions upon the user in his selection of ratios and no caveats (except one), so discretion should be used since unrealistic ratios may produce unrealistic results.

2. Permit the temporary storage (surge storage) of oil and its removal concurrent with and subsequent to the leaching process.

   When this option was first proposed there was discussion about the feasibility of doing this in AUTSKED. It is closely related to the problem of "drawdown" (i.e., the removal of oil from the SPR when it is needed). AUTSKED was not developed for this purpose and a major restructuring of the program would be required in order to have this option, therefore it has not been implemented.

3. Provide the user with the capability of reassigning cavern priorities at any time during the site development.

   This feature permits the user to allow for events that occur during site development, e.g., equipment failure at individual

caverns. This request has been accommodated in the following manner. In the interactive input to AUTSKED (see Figure 2.11, the user may specify that site scheduling be interrupted after a number of days in order to change cavern priorities. Changes in cavern priorities to be instigated at this time are requested from the user. The user may then specify that site scheduling be interrupted again at some later time for another change in priorities. This process goes on until the user chooses to continue scheduling to site completion, with no further changes in priorities. AUTSKED currently allows for 60 different cavern priority specifications (this means 59 changes after the initial prioritization). The value of 60 is arbitrary and can be changed with appropriate dimension statement modifications. For a site development time of 1200 days, this means cavern priorities could be changed every 20 days on the average.

All of this information, time of priority change and new priorities, is saved in the original input file for AUTSKED (see Figure 2.1) which was created by PREDICT. For discussion purposes, we shall call this file AUTIN. This is the reason for the feedback loop from the block labeled "AUTSKED" to the block labeled "INPUT FILE FOR AUTSKED" in Figure 2.1. If file AUTIN is used again as the input file to AUTSKED, the priority changes made previously will be part of the scheduling in AUTSKED and the user may specify some subsequent priority changes if desired. AUTSKED will then rerun and add on the priority changes.

This option is available only if the user-specified priority option is selected in AUTSKED, i.e., it is not available if the STR priority scheme (see page 5, line 8) is chosen.

4. EDITOR and PREDICT should have the same time reference as AUTSKED. If AUTSKED indicates that a change is required at day 1001 in cavern 9, the user must be able to relate day 1001 in AUTSKED to day 1001 in EDITOR and PREDICT.

This is the original statement of the request, and the first author's interpretation is as follows. Recall that PREDICT creates individual cavern schedules independent of any constraints. Thus the PREDICT schedule for cavern 9 may say that from day 200 to 300 there should be a brine flow rate of 100,000 barrels per day. "Day 200 to 300" is relative to the development of this cavern. In the site schedule produced by AUTSKED, this activity for cavern 9 may occur on day 800 to 900 (days now being relative to site development). The objective of this request is to relate day 800 to 900 in the AUTSKED site schedule to day 200 to 300 in the PREDICT schedule for cavern 9. This will allow the user, after examining the site schedule, to make changes, via EDITOR, in the PREDICT schedules in order to achieve a reduced site completion time. This correlation between day intervals in the site schedule and day intervals in the individual cavern schedules is meaningful provided that AUTSKED adheres to the original cavern schedules created by PREDICT. However, because of constraints, AUTSKED does not adhere to these schedules. For example, AUTSKED may decide that it can allocate only 50,000 barrels per day to cavern 9. The site schedule will then show a flow rate of 50,000 barrels per day to cavern 9 from day 800 to day 1000. The extra 100 days are to allow for the reduced flow rate.

Complete correlation between day intervals in the site schedule and day intervals in PREDICT cavern schedules is not possible. What has been implemented in AUTSKED is the following. A "clock" is associated with each cavern. This clock is "running" if, in AUTSKED, the cavern is being actively developed or is idle (zero brine flow rate as scheduled in PREDICT). Otherwise the clock is not running. This means that the clock is not running if AUTSKED has not scheduled this cavern for active development because of constraints. The clock is running during idle time specified in PREDICT because this is a part of the PREDICT schedule for this cavern.

This "cavern clock" is implemented as an option in the interactive input to AUTSKED. The user may or may not select it, as desired.

5. Provide a capability in AUTSKED to redefine the maximum flow rate for each cavern.

As a result of schedule changes during development, it may be necessary to redefine maximum flow rates to some caverns to effect site completion time. This has been implemented in the following way. In the interactive input to AUTSKED, the user specifies a default maximum cavern brine flow and a default maximum cavern oil flow. These default values may be used for all caverns at a site **or,** alternatively, the user may specify different maximum flow rates for individual caverns.

6. Tabulate the total oil stored and the total storage volume created per cavern and per site at each breakpoint.

This has been implemented in the interactive input to AUTSKED. It is an option which can be selected at the user's discretion. It was included to provide running totals of these parameters.

7. Maintain maximum site flow rates as long as possible even if it means flow to a cavern that has a zero flow rate requested by EDITOR.

Specification of zero flow rate to a cavern for a number of days in EDITOR was originally intended to allow active development of some caverns to begin after the start date of site development. This option has also been used to stop development of a cavern at any time in order to stagger development of caverns in the hope of reducing site completion time. The purpose of this request is to reactivate flow to some of these caverns at zero flow when there are not enough caverns being leached to use up the maximum allowable site brine flow. However, there may be other reasons for

maintaining zero flow to the caverns for the specified number of days. Therefore this request has been converted into an option in the interactive input to AUTSKED. The user may "force" zero flow rates to be maintained or opt to make them dependent on the maximum site flow utilization. This dichotomy applies to all caverns at zero flow, rather than on an individual basis.

8. Provide for a reduced flow to the lower priority caverns in lieu of reducing one or more caverns to zero flow.

This request is accommodated by number 5 where a maximum cavern brine flow can be specified for each cavern. The flow automatically will revert to the default maximum cavern brine flow when necessary to use as much of the maximum site brine flow as possible. This feature allows the continued development of caverns that would otherwise be reduced to zero flow rate for some period of time.

Figure 4.1 contains a diagram depicting the interactions among the components of the complete program. The master program SPRSKD contains as subprograms EDITOR, PREDICT and AUTSKED. As mentioned before, these three programs had previously been executed separately but are now all part of the main program, SPRSKD. The final two components are SLAM and NETWRK.

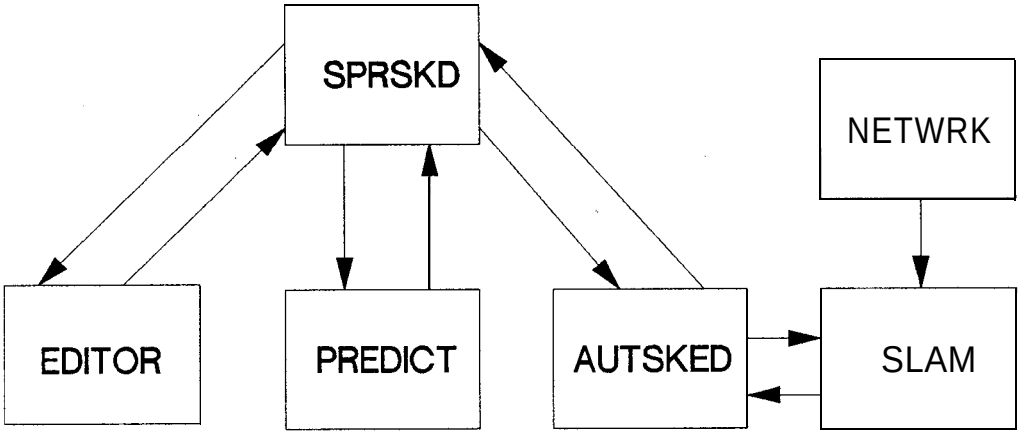


Figure 4.1. Program Interactions

SLAM is a proprietary FORTRAN program distributed by Pritsker and Associates, West Lafayette, Indiana.[5,6] SLAM provides network symbols for building graphical models which are easily translated into input statements for direct computer processing. It contains subprograms that support both discrete event and continuous model developments. The subprogram AUTSKED utilizes all three of these modeling aspects of SLAM: network, discrete event and continuous simulation. The network aspect is incorporated into NETWRK. NETWRK is a graphical description, using the SLAM syntax, of the scheduling of leaching and filling activities at an SPR site. The NETWRK file is an input to SLAM. When executing SPRSKD, this file must have the name NETWRK. The discrete event and continuous simulation aspects are in **AUTSKED's** subroutines, which SLAM calls when needed.

The program begins with **SPRSKD.** This program calls EDITOR, PREDICT or AUTSKED at the user's option. EDITOR and PREDICT are stand-alone subprograms. There is no interaction between either of them and **SLAM.** When AUTSKED is called, it calls SLAM which is then in control. SLAM reads and interprets the NETWRK file and site scheduling begins. There is considerable interaction between SLAM and AUTSKED. The subroutines in AUTSKED provide information to SLAM--information which is specific to this particular application of SLAM. In computer jargon, AUTSKED is a "library" of subroutines which is a supplement of SLM.

It is important to emphasize again that EDITOR, PREDICT, AUTSKED and SLAM are all FORTRAN programs written in ANSI FORTRAN 77. NETWRK is a special file written in a syntax understood by SLAM. The structure of this file would have to be changed only if the sequence of events involved in the development of an SPR site is changed from that described in Reference 1.

V. SUMMARY

The latest embellishments to the EDITOR, PREDICT and AUTSKED programs, which have been described in this report, provide the user with increased flexibility to modify the scheduling of leaching and filling of caverns at an SPR site. Eight requests for changes have been addressed and all but one have been implemented. The one excepted was considered to be outside the capability of the current structure of the programs and would require major changes in the structure. The result now is the master program, SPRSKD, which incorporates all three subprograms EDITOR, PREDICT and AUTSKED (see Figure 4-l).

REFERENCES

1. Dallas W. Sasser, "AUTSKED: Automated Scheduling Technique for Leaching and Filling Activities at the Strategic Petroleum Reserve," Sandia National Laboratories, Report No. SAND83-2583, March 1984.

2. Dallas W. Sasser, "AUTSKED: An Addendum," Sandia National Laboratories, Report No. SAND83-2583/2, April 1985.

3. Robert J. Gross, "User Instructions for Programs NEDIT and NPRED," Sandia National Laboratories, Report No. SAND82-2189, February 1983.

4. A. J. Russo, "User's Manual for the Solution Mining Code SANSMIC," Sandia National Laboratories, Report No. SAND83-1150, September 1983.

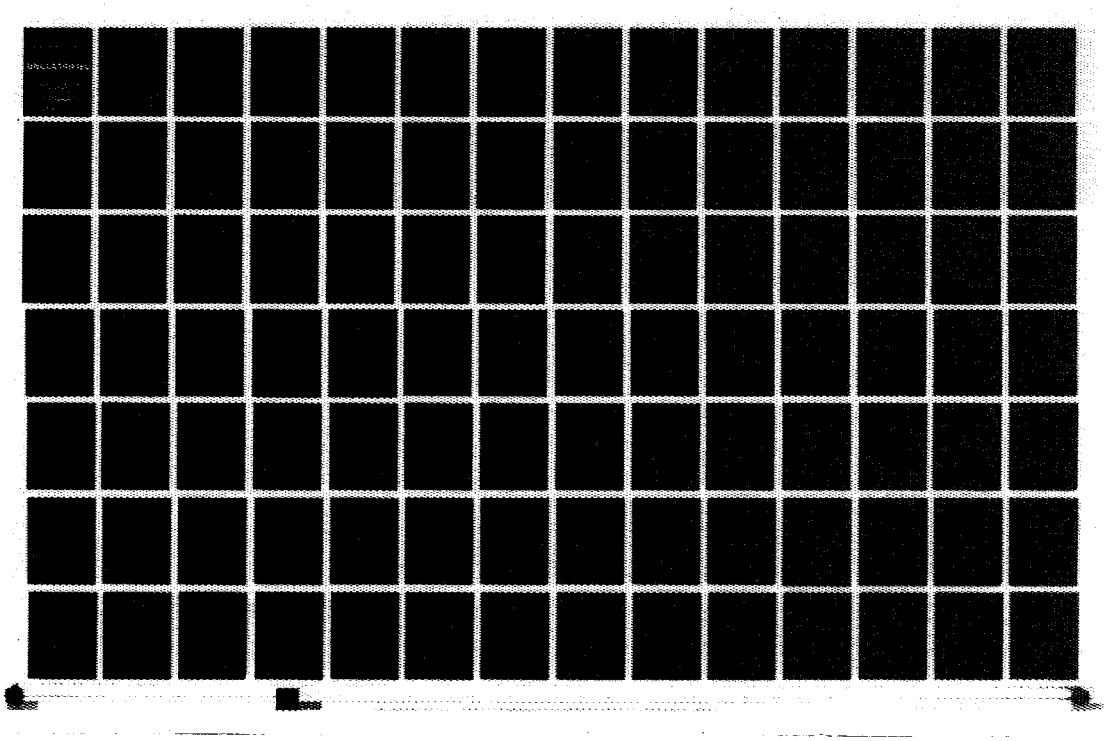
5. A. A. B. Pritsker and C. D. Pegden, "Introduction to Simulation and SLAM," Halsted Press, John Wiley, New York, and Systems Publishing Corp., West Lafayette, Indiana, 1979.

6. A. A. B. Pritsker, '*Introduction to Simulation and SLAM II," Second Edition, Halsted Press, John Wiley, New York, and Systems Publishing Corp., West Lafayette, Indiana, 1984.

APPENDIX A

PROGRAM SPRSKD LISTING

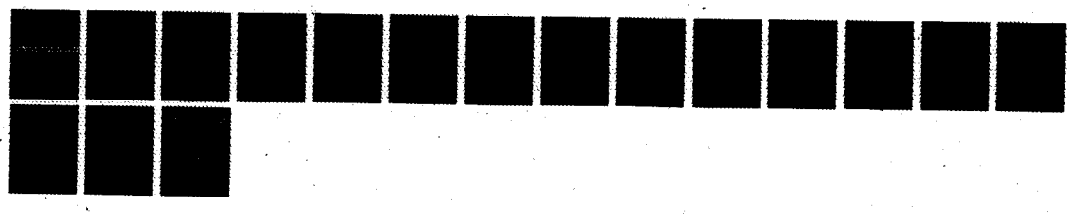
This appendix contains a listing of SPRSKD, which combines the previously separate EDITOR, PREDICT and AUTSKED programs into one program.

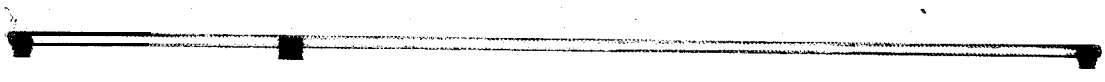


APPENDIX B

NETWRK FILE LISTING

This appendix contains a listing of the file NETWRK which is an input file used by SLAM. The statements in this file are a description, in SLAM syntax, of the scheduling of leaching and filling activities at an SPR site.





APPENDIX C

CDC NOS PROCEDURE FILE

This appendix contains a listing of the procedure file which is used on the CDC time-sharing system at SNL to execute the program SPRSKD.

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CDC NOS PROCEDURE FILE

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BSLAM is the FORTRAN-compiled program SLAM; BSPRSKD is the FORTRAN-compiled program SPRSKD; and NETWRK is the network input file to SLAM. The version of SLAM used by SNL utilizes overlay structure with FILE2 as the primary file in this structure. Overlay structure may not be necessary on other computers.

```
 .PROC,SPRSKED.
REWIND,*.
GET,BSPRSKD/UN=DKBUCHA.
GET,BSLAM/UN=DKBUCHA.
GET,NETWRK/UN=DKBUCHA.
NOEXIT.
LIBEDIT,P=BSLAM,N=NSLAM,I=0,B=BSPRSKD,L=0.
ONEXIT.
RETURN,BSLAM.
RENAME,BSLAM=NSLAM.
LIBGEN,F=BSPRSKD,P=YYYSLIB.
LDSET(MAP=SBX/YYYYMAP,LIB=YYYSLIB,USEP=BLOKDT,USEP=BLOCDT,PRESET=0)
LOAD(BSLAM)
NOGO.
FILE1.
REVERT. SCHEDULE PROGRAM TERMINATED NORMALLY
EXIT.
REVERT,ABORT.   RUN ABORTED
```

APPENDIX D

SAMPLE SPRSKD INPUT/OUTPUT

This appendix is provided to illustrate a sample interactive session between the user and SPRSKD. The narrative portion discusses the inputs required, and the actual computer output follows. The narrative discusses each input as the reader follows along using the output listing.

A SPRSKD session is initiated on SNL's computer by entering the command BEGIN,, SPRSKED. (SPRSKED is a CDC/NOS procedure file and is listed in Appendix C.) All user inputs are underlined and preceded with a ? prompt. When a RETURN key entry is the only requirement to enter the proper information, e.g. the default case, then no input is shown-just the ? prompt.

In response to the BEGIN,, SPRSKED command, SPRSKD displays a menu (see page D-15). This menu indicates that three subprograms are available (EDITOR, PREDICT and AUTSKED), and that the user has the option to select any of them. If the user is starting from scratch to develop a site schedule, then initial data must be entered into EDITOR. The output of EDITOR is then used by PREDICT to develop individual cavern schedules. Finally, the output of PREDICT is used by AUTSKED to develop a schedule for an entire site.

The example used in this appendix is the development of a two--cavern site. Most input is similar to that which is required to develop a larger site, such as 14 caverns at Big Hill. (Note that the output Listing is intended to be printed on 15-inch wide paper.)

In this example an initial file will be developed by EDITOR, so 1 is selected from the main menu. The program next displays "SPR Schedule Editor Program Version Four" and "Enter input file name or press return if creating new file" (see Page D-15). Here the return is pressed (the default) because a new file is to be created. If an existing EDITOR file

is to be changed, then that file must be made available in the local file space before SPRSKD is activated. That file name would then be entered in response to EDITOR's first interrogative. For our example here, the name of the new file to be created by EDITOR is SAMPLE. Thus, SAMPLE is entered as the output file name for the next interrogative.

The next question, "ALTER CAVERN VALUES?" must be answered yes to activate the change routine in EDITOR. This change routine includes prompts that ask for the required data entry (page D-16). Identification of caverns is limited to the numbers 101 through 120. This series was chosen to be compatible with other SPH sites. As noted at the top of page D-16, the number 1 was entered intentionally to invoke the error message. After entering the proper number, 101, the user is asked if the cavern is to be deleted ("DELETE CAVERN # 101?"). This seems inappropriate at a time when creating is the only consideration. However, as time moves forward and this cavern is completed, then it will be necessary to delete it. At this time no is entered. The delete may be invoked with a yes.

At the next prompt, "ENTER? OR OPT# OR ALL: (DEFAULT = ?, FOR HELP ---0 = EXIT)," the user is expected to enter the necessary data into the file SAMPLE in seven steps. At this point the default will display the data entry fields as illustrated next on page D-16. Data may be entered by entering the OPT# and then the corresponding data in seven steps or the user may enter ALL and then be prompted for the seven data fields one at a time. The seven data field OPT#'s plus the three other OPT#'s are explained below.

This is also the point in the EDITOR program at which changes to an existing data file may be made. The user may call the necessary OPT#'s and enter changes as required. To retain existing data in any OPT#, enter the default (press just the enter key).

"0 ---- Exit" - To exit from this subroutine.

"1 ---- Mode + FOV" - Modes are: 0 = leach/fill, L/F; 1 = leach--then-fill, LTF; 2 = intermittent leach then fill, I/F. FOV = final oil volume.

"2 ---- END VOLS" - The total cavern volume at the end of each development stage - sump, sump/chimney, 1st reverse (REV1), 2nd reverse (REV2-1, REV2-2) and 3rd reverse (REV3-1, REV3-2).

"3 ---- Current Vols" - Current cavern volume and current oil volume. When starting, of course, these are zero.

"4 ---- Workovers" - The amount of downtime (in DAYS) to do a workover at the end of each development stage.

"5 ---- BPR Schedule" - This provides for the brine production rates during development and oil fill. Up to nine entries may be made.

"6 ---- I/F Oil Vols" - This is used to define the intermittent oil volumes when that mode is selected for data field 1 above.

"7 ---- Oil Fill Rates" - For final oil fill or I/F.

"All ---- 1 through 7" - When this option is selected, the program automatically sequences through the above seven steps displaying current values in the data fields (which are default values in this example with a newly created file) and then displaying prompts for input of new values. This is the proper response to the next prompt for inserting original data into all fields. For changing data in any specific data field, the number of that field would be the proper response to the next prompt.

"? ---- Opt Help" - This will redisplay the data fields menu. This is also the default.

With the request "MODE??" data entry begins with the leaching mode. The default mode is L/F, but for the sample here, the leach-then-fill mode (LTF) is chosen by entering a 1. "FOV??" - the final oil volume, is the next input request. It has a 10,000.00 MB default. For our sample

here, the FOV is changed to 11500 MB. (Note the warning which is issued for values above 10,000 MB on page D-16.)

A default **workover** schedule is displayed next and the user is asked if the stage endvolumes are to be recomputed. Since the endvolumes for the sample problem have not been entered, the response to this question is yes. The default endvolumes are displayed and redisplayed at the top of page D-17. Following these displays, the individual endvolumes are sequentially displayed along with prompts to allow changing as desired. The new endvolumes are entered one at a time as illustrated on page D-17. Since the caverns in the sample are developed with only two reverse stages, the inputs for numbers 6 and 7 are the same as input number 5. The endvolumes selected for this sample problem are as follows:

#1 ?	470 MB	This is the total cavern volume at the end of sump development and replaces the . 00 MB as the default sump volume .
#2 ?	2770 MB	Total volume at the end of sump/chimney. (Replaces the 3574.20-MB default.)
#3 ?	6094 MB	Total volume at the end of first reverse (REV1). (Replaces the 5892.60-MB default.)
#4 ?	9578 MB	A number between those used in 3 (REV1) and 5 (REV2-2) to satisfy the program. There used to be a **workover** at this point so the program requires data here at REV2-1. (Replaces the 8191.45~MB default.)
#5 ?	12800 MB	Total volume at the end of 2nd reverse (REV2-2). (Replaces the 10215.45-MB default.)
#6 ?	12800 MB	Since the cavern is fully developed at the end of Rev2-2, there is no further leaching. Steps 6 and 7 are left in the program in case a three- reverse system needs to be investigated. (Replaces the 12880.00-MB default.)
#7 ?	12800 MB	Same comment as for 6.

"CCV ??" - the current cavern volume, and "COV **??"** - the current oil volume, are the next requests. Since the user is starting a new cavern, both the current cavern volume (CCV) and the current oil volume (COV) are .oo MB. (In each case the default was used.) This option also permits restarting a cavern for a current volume other than zero.

The previously displayed default **workover** schedule is displayed again. For the sample case, a different **workover** series is input. Therefore, seven entries are made in response to the following prompts:

"#1 ?"	10 Days.	At the end of sump. (Replaces the 0 day default.)
"#2 ?"	10 Days.	After sump/chimney. (Replaces the 20 days default.)
"#3 ?"	15 Days.	After 1st reverse **(REV1).** (Replaces the 20 days default.)
"#4 ?"	0 Days.	After **REV2-1** because no **workover** is planned. **(REV2-1** is used in the leach/fill mode.)
"#5 ?"	15 Days.	After completion of second reverse **(REV2-2).** This is the end of cavern development. (Replaces the 20 days default.)
"#6 ?"	0 Days.	After **REV3-1.**
"#7 ?"	0 Days.	After **REV3-2.** (Replaces the 20 days default.)

Next, the brine production rate schedule (BPRS) in thousands of bbl/day is requested as on page D-18 **("BPRS=").** The line **"BPRS="** through the line **"#1?"** are next displayed. The default value of brine production rate is 150 MBD. Since the average design flow rate is 175 MBD for Big Hill caverns, that rate **will** be used. If the default brine production rate is not to be used, as in this example, then the desired rate along with its number of days is sequentially entered. When values for one time interval are entered, a prompt is displayed for the next interval until the entry with the ***,** designating cavern completion, has been made. Note that times entered for each interval are total days from beginning of sump development. The brine production rate schedule, displayed on page D-18 and following, reflects that the sump will be

developed at 50 MBD for 95 days. At the end of 95 days the cavern volume is calculated to be 421 MB. At that time the second well in the cavern will be opened (since coalescence will have occurred), and the flow will be increased to 85 HBD. The 85 MBD in the two-well configuration can be accomplished at the same raw water manifold pressure as 50 MBD in one well. The intent of the 85 MBD for varying lengths of time will permit using the workover rigs continuously without taking caverns off-line. This will result in different-sized sumps but this is corrected in sump/chimney development by going to similar total volumes in all caverns. The BPRS is entered as follows:

50.95	---	This means 50 MBD for 95 days.
85,103	- -	85 MBD from day 95 through day 103.
175,392	- -	175 MBD through day 392.
0.480	---	0 MBD through day 480 to illustrate that zero flow may be programmed into the schedule at any time.
175,*		175 MBD for the remainder of the time.

The program will discontinue calculations for each stage of cavern development when the previously defined endvolume for that stage is reached regardless of whether the days required corresponds to that defined above.

The next prompt, page D-18, is for the final oil fill rate, for which the default value is 50 MBD. Again, since Big Hill design was for 175 MBD oil fill rate, that is used in the sample. At this point, data have been entered in the seven data fields of "Editor" for cavern 101. At the next prompt, 0 is entered to exit the menu (pages D-2, D-3, and D-16) and return to the prompt for the ID of the next cavern. The next cavern is entered as 102. When the "DELETE CAVERN #102??" prompt is answered NO, then all the data entered in Cavern 101 are now duplicated in Cavern 102. It is easier to go into the 102 data file and change endvolumes and the brine production rate schedule than to enter all data. Again, referring back to the information required in the seven data fields (see page D-16), one may find the numbers of the data fields

in which changes are to be made for Cavern 102. We want to change the **sump,** sump/chimney and **REV1** endvolumes, so we enter a 2 and the program displays the endvolumes stored for Cavern 102, page D-19. (These are the same as are stored for Cavern **101.)** After the endvolumes are displayed, they may be changed one at a time by entering new numbers as shown on page D-19. Note that the first three endvolumes were changed by inputs and that the last four were left unchanged by using the default. After the last endvolume is changed the prompt again asks in which of the seven data fields are changes to be made? To change the brine production rate schedule **(BPRS),** 5 is entered. The program responds with the data stored in the BPRS file. This is the same information copied from the data input for Cavern 101. Again, the operator is given a chance to change each entry line by Line. The sump development at 50 MBD for 95 days repeats for Cavern 102 so the default is used. For step two, the 85 MBD from day 95 through 138 is entered and replaces the BPRS used for Cavern 101. This is entered by 85,138. The cavern is to be completed at a BPRS of 175 MBD. To indicate that this is the last entry in the BPRS field, the * is used. The **175*** was entered without the comma so that the error message would be displayed. Finally, the **175,*** was entered which EDITOR understood.

The data option request line is displayed again asking if more changes to Cavern 102 are desired. Since all corrections have been made, a 0 is entered and the next cavern to be added is requested. If another cavern were entered, it would have the same data in its file as **Cavern** 102. Since two caverns are sufficient for this sample, the default is entered and a request for a "File Postview?" is displayed. This request is answered by entering **YES.** (See page D-20.) The request to view **all** caverns is entered and the response indicates that 2 of 20 caverns are to be developed by displaying all data for Caverns **101** and 102, and by indicating 18 caverns are inactive. (See pages D-20 and D-21.) The user is next asked, "Done with EDITOR?" Answer **YES.** This completes the session with the EDITOR subprogram in SPRSKD, and the user is notified that the file containing all the required data is called SAMPLE (see page D-21).

The main menu is displayed again and at this point PREDICT is selected by entering **2.** The prompt is for the input file name from the EDITOR subprogram, so the entry is SAMPLE as illustrated on page D-22. The next prompt is for a "File Name For PREDICT Output." By inputting a file name here the output is saved in a file by that name, thus saving the time of having it printed on the screen. The file can be printed later when it is necessary to exit from SPRSKD. The PREDICT output file has been named PREOUT for this illustration. The next prompt is to assign a "File Name For AUTSKED Input." This is entered as **AUINPUT.** PREDICT next queries, "Do You Wish To Evaluate All Active Caverns?'* The note displayed at this point requires that the question be answered yes if AUTSKED is to be run. If all caverns are not evaluated by PREDICT, then the input to AUTSKED will include only those evaluated by the running of PREDICT during this session. Here the default is set to provide the yes input. File AUINPUT provides AUTSKED with individual cavern schedules. The breakpoint prompt must be answered yes also so that AUTSKED can operate on all caverns simultaneously. Again the default is yes. The next two prompts are answered yes so that the output can be examined in this Appendix. (Normally these two questions would be answered with the default which is **no.**) All PREDICT output is shown on pages D-26 and D--27 following completion of the interactive session with SPRSKD. The PREDICT subprogram runs ***very*** quickly but displays no output if an output file name has been previously assigned.

After PREDICT completes its calculations, the main menu is displayed again (see page D-22) and 3 is selected this time to run AUTSKED. The first prompt asks for the **"Name** Of The AUTSKED Input File From PREDICT." This file name is entered as AUINPUT. The prompt then asks for the "Name Of The AUTSKED Output File." This file name is entered as AUOUT, and stands for the final schedule or product we desired when we started this procedure at step 1 in the main menu. The AUOUT file is illustrated at the end of this Appendix.

AUTSKED prompts for the following:

1. "Maximum Brine Flow For Site." 1400 MBD is used here since it is the design value for Big Hill.
2. "Maximum Oil Flow For Site." 220 MBD is used because it is a Big Hill design value also.
3. "Maximum Brine Flow (Default) For Caverns."* (There is a warning that it must exceed 40 MBD to produce valid predictions.) This will permit caverns to receive up to the default amount as a maximum in the event that the maximum brine flow for the site falls below the value specified in 1 above. Another Big Hill design value is entered here 175 MBD.
4. "Use Default Brine Flow For All Caverns?" The default of yes here means that the maximum flow to all caverns is that listed in item 3. If no is entered, then the user has an opportunity to specify the maximum value for each cavern later.
5. "Maximum Oil Flow (Default) For Caverns." This input affects oil limits the same way item 3 affects brine limits. 175 MBD is the design maximum oil flow per cavern.
6. "Use Default Oil Flow For All Caverns?" Similar to item 4.
7. "Enter Number Of Workover Rigs." Enter the number of workover rigs that are available during site development. The example here assumes two rigs will be available. Therefore, 2 is entered.
8. "Priority Choice."

   a. "Shortest Time Remaining" - this is an automatic priority setting that AUTSKED assigns during its computations.

   b. "User Input Priority" - this permits the user to assign priorities. In the sample case, spacing between wells at the bottom of the hole was used.

   c. "Cavern Number Minus 100" - this will automatically finish Cavern 101 first, 102 second, etc. For our sample case, priority 2 was selected.

9. "Do You Want A Clock For Each Cavern?" This option permits the user to view the difference between the individual cavern development time calculated in PREDICT and the time required to complete each cavern in AUTSKED. This difference is more apparent as more caverns are added. In our sample the clock option was selected, but with only two caverns the effect of the clock is not very apparent.
10. "Do You Want A Cavern/Oil Volume Tabulation At Each Breakpoint?" This option lists the total cavern and oil volumes for each cavern at each time breakpoint and also the totals for the entire site.
11. "Do You Want Zero Flow Rates Maintained (Y) Or (N) Dependent On Max Site Flow Utilization?" In our sample case we use some zero flow time in EDITOR and PREDICT. This is recognized in PREDICT as "idle" time. However, in AUTSKED we ask the subprogram to depend upon maximum site flow utilization. As a result, Cavern 101 is completed in 718 days instead of the 806 days that PREDICT calculates. The 88 days of zero flow or idle time that was input into EDITOR (from day 392 to 480) is overridden by AUTSKED. Tf YES is selected in the sample problem, then the site demand for maximum brine flow does not override the request for idle time, and Cavern 101 is developed in 806 days.
12. "Enter Project Start Date" (see page D-23). We use 07/01/87 for our sample problem.
13. '*Scheduling Options." Option 1 will permit AUTSKED to run through completion of the site. Option 2 permits the user to stop AUTSKED at any future date and to reassign priorities. We select 2.
14. If option 2 is selected, then the user must input the "Number Of Days" on which priority changes will be made. In our sample, 150 days is selected. For subsequent changes, the total number of days from the start of leaching must be used.
15. "Enter Cavern Priorities." 1=highest, 2=next, etc. No input is required here.

16. "Enter Priority For Cavern 101." We enter 1 here.
17. "Enter Priority For Cavern 102." We enter 2.
18. "Would You Like An Echo Of Your Input And The Option To Make Changes?" Yes was selected. The echo is illustrated on page D-24, and shows the inputs as given by the user. Since the echo is more than a screen full, it is divided into three sections and requires pressing the RETURN key to continue.
19. Make a choice from the menu (see page D-24). Since everything is as we had requested, selection 16 is chosen and the program begins to execute.
20, 21. "Enter Cavern Priorities." The program stops after 150 days to permit the user to change the priorities assigned to each cavern. The priority for Cavern 101 is changed to 2, and for Cavern 102, to 1. See page D-25.
22. Scheduling option is again displayed and option 2 is the intended choice. However, the user anticipates the next question and enters 375 by mistake. The program responds with a "Bad Input" error message and the user enters 2.
23. "Enter Number Of Days." This is the total number of days from day 1, not the last priority change day. The user enters 375. This sequence (Steps 20 through 22) is repeated one more time and the user selects development completion by entering a 1 at the last opportunity. See page D-25.

The program completes its calculation, and the main menu is displayed once again. The exit choice, 4, is selected and the schedule created by AUTSKED is written to the file AUOUT.

To review the data that was selected as input for this sample exercise, see the EDITOR file on page D-20. This lists all of the data for Caverns 101 and 102 and states that the other 18 caverns are inactive. Next, print out the file PREOUT which contains the data in PREDICT. This file is printed out starting on page D-26 and continues to the page D-27. The Caverns 101 and 102 breakpoints provide all the data needed by AUTSKED. The site breakpoints on page D--27 of the Attachment

are shown as examples of data available in PREDICT, and indicate how long it would take to develop the site provided there are no changes in schedule, i.e., zero flow time is not overridden by AUTSKED. They also List total cavern and oil volumes, average daily oil flow and brine production rates. The final listing, Site Summary on page D-27 indicates total cavern and oil volumes, oil use and average flow during each 90 day interval. These data are listed at 90-day intervals because that is what the user requested when inputs were given to PREDICT.

Finally, the output from the AUTSKED subprogram is printed from the AUTSKED output file AUOUT. This output follows the PREDICT output (starts on page D-28). The file starts with a review of some of the input data, and a legend to explain the letters and numbers used in the listing.

The first Listing is in pairs of Lines because we asked for the cavern clock option. The first line contains the date, the number of days from day 0, the brine production rate for Cavern 101 and its development stage and finally the brine production rate for Cavern 102 and its development stage. The cavern clock on Line two lists the development day from PREDICT that corresponds to where that cavern is in its development. If a cavern is delayed in AUTSKED due to constraints, the day number on Line one will, continue with the real clock, but the cavern clock will stop. The cavern clock will resume when cavern development resumes, and the difference between the day number on line one and the cavern clock will indicate how many days the cavern was off-line or not being developed. If it is necessary to go back to EDITOR and change zero flow times, water flow rates or oil flows at some day into the schedule, then cavern clock time must be used when figuring where to enter the change in EDITOR.

The total time for site development is shown to be 772 days on page D-30. This is 34 days less than PREDICT calculated per pages D-26 and D-27. The difference between the cavern clock and the number of days

from day zero (start of site development) is due to the fact that the AUTSKED subprogram overrode the idle time that was entered into EDITOR and PREDICT for Cavern 101. There is another consideration that affects this difference, and that is the oil fill rate of Cavern 102. PREDICT indicates a completion time of 742 days for Cavern 102. This is based upon a final oil fill rate of 175 MBD for 54 days. However, since the entire site can flow only 220 MBD of oil at any time and since Cavern 101, which is being filled at a rate of 175 MBD, has higher priority than Cavern 102, only 45 MBD of oil are available to fill Cavern 102 until Cavern 101 completes filling. This results in the 30-day difference between the cavern clock and the time from PREDICT.

The next information on page D-30 includes statistics for variables based on observation. These data are calculated from the cavern completion times calculated in PREDICT. (718 days for cavern 101 and 772 days for cavern 102.) These values are self explanatory.

The statistics for time-persistent variables pertain to the intermittent oil fill mode. Since our sample illustration is for the leach-then-fill mode, these statistics do not apply. Tn the intermittent oil fill mode, these statistics would apply to the first oil fill period.

The remaining information on page D-30 defines the various files used in the program. Note that there is no file 2 and that F2 is used as final fill for the leach-then-fill mode. Therefore, File 3 does not apply here. (It is used in the intermittent oil fill mode.)

On pages D-31 and D-32 printouts for each of the five files listed on page D-30 are displayed. TNOW is the time that the table is printed. QQTTM is the last time the file was accessed. These printouts are all for data contained in the files at the end of the run where the time is 772 days. These files may be used as diagnostic during the run but at the end of the run they are all empty and of no value. The Resource Statistics listed on page D-32 provide the statistical data defined for each of the four resources numbered and labeled.

The next listing titled table number 1, pages D-32, D-33, and D-34, defines the total site brine flow rate **(B)**, the total site oil flow rate **(O)**, the total site cavern volume **(C)**, and the total site oil volume **(V)**. These are instantaneous values at ten-day intervals. These data are plotted on page D-35. Note that the duplicates in the right column mean the pairs of letters listed have the same values on the plot. One of the letters is printed on the plot but the other is not, simply to avoid overstriking the two letters.

The final listing on page D-36 includes total cavern and oil volumes for Cavern 101 in columns one and two; the same for Cavern 102 in columns 3 and 4; and site totals in columns 5 and 6.

This completes the sample interactive session using SPRSKD.

/begin,,sprsked

********** MENU **********

1. EDIT OLD SITE FILE OR CREATE NEW SITE FILE USING EDITOR
2. DEVELOP INDIVIDUAL CAVERN SCHEDULES USING PREDICT
3. DEVELOP SITE SCHEDULE USING AUTSKED
4. EXIT FROM PROGRAM

ENTER NUMBER OF CHOICE
? 1

SPR SCHEDULE EDITOR PROGRAM
VERSION FOUR

ENTER INPUT FILE NAME OR PRESS RETURN
IF CREATING NEW FILE

? NEW SITE FILE WILL BE CREATED
ENTER OUTPUT FILE NAME

? Sample

NEW FTLE SAMPLE WILL BE CREATED

ALTER CAVERN VALUES??(Y/N,N=DEFAULT)
? Y
YES

```
 CAVERN ID# ??(DEFAULT=NO MORE)
?1
 RANGEERROR:   MUST BE [ 101 TO 120 ]

 CAVERN ID# ??(DEFAULT=NO MORE)
?101
 ID# = 101

 DELETE CAVERN# 101 ??(Y/N, N=DEFAULT)
?n
 NO

 ENTER ? OR OPT# OR ALL:(DEFAULT=?, FOR HELP ---- 0=EXIT)
?


    0    ----- EXIT
    1    ----- MODE + FOV
    2    ----- END VOLS
    3    ----- CURRENT VOLS
    4    ----- WORKOVERS
    5    ----- BPR SCHEDULE
    6    ------ I/F OIL VOLS
    7    ----- OIL FILL RATES
   ALL   ----- 1 THRU 7
    ?    ----- OPT HELP

 ENTER ? OR OPT# OR ALL:(DEFAULT=?, FOR HELP ---- 0=EXIT)
?all
 ALL

 THE LEACH MODE IS L/F

 MODE ??   <0=L/F, 1=LTF, 2=I/F>(DEFAULT=NO CHANGE)
?1
 THE MODE IS LTF

 FOV = 10000.00 MB

 FOV??(DEFAULT=NO  CHANGE)
111500
 11500.00  MB
 WARNING:   MUST BE < OR = TO FINAL CAVERN VOLUME

   THE NEW WORKOVERS ARE:
        SUMP    SUMP-CH    REV1   REV2-1   REV2-2   REV3-1   REV3-2
           0         20      20        0       20        0       20  DAYS

 DO YOU WANT THE STAGE ENDVOLUMES RECOMPUTED??
                    (Y/N, N=DEFAULT)
?y
 YES
```

```
    THE NEW ENDVOLUMES ARE:
          SUMP    SUMP-CH     REV1    REV2-1    REV2-2    REV3-1    REV3-2
            .OO   3574.20   5892.60   8191.45  10215.45  12880.00  12880.00  MB

 ENDVOLUMES =
          SUMP    SUMP-CH     REV1    REV2-1    REV2-2    REVS-1    REV3-2
            .OO   3574.20   5892.60   8191.45  10215.45  12880.00  12880.00  MB

          PRESS RETURN FOR NO CHANGE
 #1 ?
? 470
   470.00 MB
 #2 ?
? 2770
    2770.00 MB
 #3 ?
? 6094
    6094.00 MB
 #4 ?
? 9578
    9578.00 MB
 #5 ?
? 12800
   12800.00 MB
 #6 ?
? 12800
   12800.00 MB
 #7 ?
? 12800
   12800.00 MB

   ccv =        .oo MB    cov =        .oo MB

    CCV??(DEFAULT=NO CHANGE) ,
?
         .oo MB

    COV??(DEFAULT=NO  CHANGE)
?
         .oo MB

 WORKOVERS =
          SUMP    SUMP-CH     REV1    REVS-1    REV2-2    REV3-1    REV3-2
             0         20       20         0        20         0        20  DAYS

          PRESS RETURN FOR NO CHANGE
 #1 ?
? 10
      10 DAYS
 #2 ?
? 10
      10 DAYS
 #3 ?
? 15
      15 DAYS
```

```
 #4 ?
? 0
       0 DAYS
 #5 ?
15
?     15 DAYS
 #6 ?
? 0
       0 DAYS
 #7 ?
0
?         0 DAYS

 BPRS =
   150.00, *

    PRESS RETURN FOR NO CHANGE

 # 1 ?
? 50.95
     50.00,     95
 # 2 ?
? 85,103
     85.00,    103
 # 3 ?
? 175,392
     175.00,    392
 # 4 ?
? 0,480
       .00,    480
 # 5 ?
? 175,*
     175.00,    *

   FINAL OIL FTLL RATE = 50.00 MB

   FILL RATE??(DEFAULT=NO CHANGE)
? 175
     175.00 MB

 ENTER ? OR OPT# OR ALL:(DEFAULT=?, FOR HELP ----- 0=EXIT)
?0
 0

 CAVERN ID# ??(DEFAULT=NO MORE)
?102
 ID# = 102

 DELETE CAVERN# 102 ??(Y/N, N=DEFAULT)
?
 NO

 ENTER ? OR OPT# OR ALL:(DEFAULT=?, FOR HELP ---- 0=EXIT)
?2
 2
```

```
 ENDVOLUMES =
        SUMP     SUMP-CH      REV1     REV2-1     REV2-2     REV3-1     REV3-2
      470.00    2770.00    6094.00    9578.00   12800.00   12800.00   12800.00 MB

          PRESS RETURN FOR NO CHANGE
 #1 ?
? 679
  679.00 MB
 #2 ?
? 2710
  2710.00 MB
 #3 ?
? 6092
  6092.00 MB
 #4 ?
?
  9578.00 MB
 #5 ?
?
  12800.00 MB
 #6 ?
?
  12800.00 MB
 #7 ?
?
  12800.00 MB

  ENTER ? OR OPT# OR ALL:(DEFAULT=?, FOR HELP ---- 0=EXIT)
? 5
  5

  BPRS =
     50.00, 95
     85.00, 103
    175.00,  392
       .oo,  480
    175.00, *

     PRESS RETURN FOR NO CHANGE

 # 1 ?
?
     50.00,   95
 # 2 ?
? 85.138
     85.00,  138
 # 3 ?
? 175*
  INPUT ERROR:   INCORRECT REAL FORMAT OR CHARACTER
 # 3 ?
? 175,*
    175.00,  *
```

```
  ENTER ? OR OPT# OR ALL:(DEFAULT=?, FOR HELP ---- 0=EXIT)
? 0
  0

  CAVERN ID#??(DEFAULT=NO MORE)
?
  FILE POSTVIEW??(Y/N, N=DEFAULT)
?Y
 YES

  ENTER CAVERN#S OR ALL:
? all

 101 IS ACTIVE
     MODE IS LTF

      ccv =       .oo MB

      cov =       .oo MB

      FOV = 11500.00 MB
     BPR# 1 =    50.00,     95 (MB/DAY,LASTDAY#)
     BPR# 2 =    85.00,    103 (MB/DAY,LASTDAY#)
     BPR# 3 =   175.00,    392 (MB/DAY,LASTDAY#)
     BPR# 4 =      .00,    480 (MB/DAY,LASTDAY#)
     BPR# 5 =   175.00,    *   (MB/DAY,LASTDAY#)

     OIL FILL RATE = 175.00 MB

               SUMP   SUMP-CH    REV1   REV2-1   REV2-2   REV3-1   REV3-2
      EVS =   470.00  2770.00  6094.00 9578.00  12800.00 12800.00 12800.00 MB
     DELAYS =  10       10       15       0       15       0        0 DAYS

 102 IS ACTIVE
     MODE IS LTF

      ccv =       .oo MB

      cov =       .oo MB

      FOV = 11500.00 MB
     BPR# 1 =    50.00,     95 (MB/DAY,LASTDAY#)
     BPR# 2 =    85.00,    138 (MB/DAY,LASTDAY#)
     BPR# 3 =   175.00,    *   (MB/DAY,LASTDAY#)

     OIL FILL RATE = 175.00 MB

               SUMP   SUMP-CH    REV1   REV2-1   REV2-2   REV3-1   REV3-2
      EVS =   679.00  2710.00  6092.00 9578.00  12800.00 12800.00 12800.00 MB
     DELAYS =  10       10       15       0       15       0        0 DAYS

 103 IS INACTIVE

 104 IS INACTIVE
```

```
 105 IS INACTIVE

 106 IS INACTIVE

 107 IS INACTIVE

 108 IS INACTIVE

 109 IS INACTIVE

 110 IS INACTIVE

 111 IS INACTIVE

 112 IS INACTIVE

 113 IS INACTIVE

 114 IS INACTIVE

 115 IS INACTIVE

 116 IS INACTIVE

 117 IS INACTIVE

 118 IS INACTIVE

 119 IS INACTIVE

 120 IS INACTIVE

  DONE WITH EDITOR??(Y/N)

? Y

**** EDITING COMPLETED ****
          SITE FILE WITH CHANGES IS SAMPLE


                          ********** MENU **********

    1.  EDIT OLD SITE FILE OR CREATE NEW SITE FILE USING EDITOR

    2.  DEVELOP INDIVIDUAL CAVERN SCHEDULES USING PREDICT

    3.  DEVELOP SITE SCHEDULES USING AUTSKED

    4.  EXIT FROM PROGRAM

 ENTER NUMBER OF CHOICE
? 2
```

```
 ENTER INPUT FILE NAME FROM EDITOR
? sample
 ENTER FILE NAME FOR PREDICT OUTPUT
          (DEFAULT =OUTPUT, I.E. THE TERMINAL)
? preout
 ENTER FILE NAME FOR AUTSKED INPUT
? auinput

DO YOU WISH TO EVALUATE ALL ACTIVE CAVERNS?
          (Y OR N, DEFAULT = Y)
  NOTE:   ANSWER Y IF YOU ARE GOING TO RUN AUTSKED
?
 DO YOU WANT BREAKPOINT DATA FOR EACH CAVERN?
          (Y OR N, DEFAULT = Y)
  NOTE:   ANSWER Y IF YOU ARE GOING TO RUN AUTSKED
?
 DO YOU WANT THE STTE BREAKPOINT SUMMARY?
          (Y OR N, DEFAULT = N)
? Y
 DO YOU WANT A SITE INCREMENTAL SUMMARY?
          (Y OR N, DEFAULT = N)
? Y
 ENTER REPORT INCREMENT IN DAYS [D:90]
?

**** PREDICT CAVERN SCHEDULES COMPLETED ****
          FILE FOR INPUT TO AUTSKED IS AUINPUT
           PREDICT CAVERN SCHEDULES IN FILE PREOUT


                          ********** MENU ************

    1.  EDIT OLD SITE FILE OR CREATE NEW SITE FILE USING EDITOR

    2.  DEVELOP INDIVIDUAL CAVERN SCHEDULES USING PREDICT

    3.  DEVELOP SITE SCHEDULE USING AUTSKED

    4.  EXIT FROM PROGRAM

 ENTER NUMBER OF CHOICE
? 3

 ENTER NAME OF AUTSKED INPUT FILE FROM PREDICT
? auinput
 ENTER NAME OF AUTSKED OUTPUT FTLE
? auout
```

```
 ENTER MAX BRINE FLOW FOR SITE(MB/DAY)
? 1400
 ENTER MAX OIL FLOW FOR SITE(MB/DAY)
? 220
 ENTER MAX BRINE FLOW (DEFAULT) FOR CAVERNS(MB/DAY)
      (MUST BE AT LEAST 40)
? 175
 USE DEFAULT BRINE FLOW FOR ALL CAVERNS?(Y/N,DEFAULT=Y)
?
 ENTER MAX OIL FLOW (DEFAULT) FOR CAVERNS(MB/DAY)
? 175
 USE DEFAULT OIL FLOW FOR ALL CAVERNS?(Y/N,DEFAULT=Y)
?
 ENTER NUMBER OF WORKOVER RIGS
? 2
 PRIORITY CHOICE
           1.  SHORTEST TIME REMAINING
           2.  USER INPUT PRIORITY
           3.  CAVERN NUMBER MINUS 100

 ENTER NUMBER OF CHOICE
? 2
 DO YOU WANT A CLOCK FOR EACH CAVERN?(Y/N,DEFAULT=N)
? y
 DO YOU WANT A CAVERN/OIL VOLUME TABULATION AT EACH
 BREAKPOINT?(Y/N, DEFAULT=N)
? y
 DO YOU WANT ZERO FLOW RATES MAINTAINED (Y) OR
 (N) DEPENDENT ON MAX SITE FLOW UTILIZATION ?(Y/N,DEFAULT=Y)
? n
 ENTER START DATE FOR PROJECT
 IN THE FORMAT MM/DD/YY
 EXAMPLE:  04/08/83
? 07/01/87
 SCHEDULING OPTIONS
      1.  DEVELOP SCHEDULE TO SITE COMPLETION
      2.  STOP SCHEDULE AFTER A NUMBER OF DAYS
            AND REPRIORITIZE THE CAVERNS

 ENTER NUMBER OF CHOICE
? 2
 ENTER THE NUMBER OF DAYS
? 150
 ENTER CAVERN PRIORITIES--
 1 HIGHEST, 2 NEXT, ETC.

 ENTER PRIORITY FOR CAVERN 101
? 1
 ENTER PRIORITY FOR CAVERN 102
? 2
      WOULD YOU LIKE AN ECHO OF YOUR INPUT
      AND THE OPTION TO MAKE CHANGES? (Y/N, DEFAULT=N)
? y
```

** ECHO OF INPUT **

MAXIMUM BRINE FLOW FOR SITE	1400 MB/DAY
MAXIMUM OIL FLOW FOR SITE	220 MB/DAY
MAX BRINE FLOW(DEFAULT) FOR CAVERNS	175 MB/DAY
MAX OIL FLOW(DEFAULT) FOR CAVERNS	175 MB/DAY
NUMBER OF WORKOVER RIGS	2
PROJECT START DATE	07/01/87
CAVERN CLOCK OPTION	YES
CAVERN/OIL VOLUME TABULATION	YES
FORCED ZERO FLOW OPTION	NO

PAUSE PRESS RETURN TO CONTTNUE
?

MAX FLOW RATES AND INITIAL PRIORITIES

CAVERN NUMBER	PRIORITY	MAX BRINE FLOW	MAX OIL FLOW
101	1	175	175
102	2	175	175

PAUSE PRESS RETURN TO CONTTNUE
?

MAKE A CHOICE FROM THE MENU

*** MENU ***

1. CHANGE MAX SITE BRINE FLOW
2. CHANGE MAX SITE OIL FLOW
3. CHANGE MAX BRTNE FLOW(DEFAULT) FOR CAVERNS
4. CHANGE MAX OIL FLOW(DEFAULT) FOR CAVERNS
5. CHANGE MAX BRINE FLOW FOR A CAVERN
6. CHANGE MAX OIL FLOW FOR A CAVERN
7. CHANGE NUMBER OF WORKOVER RIGS
8. CHANGE CAVERN CLOCK OPTION
9. CHANGE CAVERN/OIL VOLUME TABULATION
10. CHANGE FORCED ZERO FLOW OPTION
11. CHANGE PROJECT START DATE
12. CHANGE PRIORITY TYPE(STR OR USER)
13. CHANGE CAVERN USER PRIORITY
14. DISPLAY CURRENT CAVERN PRIORITY TABLE
15. DO INPUT ECHO AGAIN
16. EXIT TO PROGRAM EXECUTION
17. TERMINATE THIS RUN

? 16

SCHEDULING PROGRAM IS EXECUTING

SCHEDULING STOPPED AT DAY 150 IN ORDER TO
CHANGE CAVERN PRIORITIES.

ENTER CAVERN PRIORITIES--
1 HIGHEST, 2 NEXT, ETC.

```
 ENTER PRIORITY FOR CAVERN 101
? 2
 ENTER PRIORITY FOR CAVERN 102
1
? SCHEDULING OPTIONS
        1.  DEVELOP SCHEDULE TO SITE COMPLETION
        2.  STOP SCHEDULE AFTER A NUMBER OF DAYS
              AND REPRIORITIZE THE CAVERNS

 ENTER NUMBER OF CHOICE
? 375
 BAD INPUT---TRY AGAIN
 SCHEDULING OPTIONS
        1.  DEVELOP SCHEDULE TO SITE COMPLETION
        2.  STOP SCHEDULE AFTER A NUMBER OF DAYS
              AND REPRIORITIZE THE CAVERNS

 ENTER NUMBER OF CHOICE
? 2
 ENTER THE NUMBER OF DAYS
? 375

 SCHEDULING CONTINUING

 SCHEDULING STOPPED AT DAY 375 IN ORDER TO
CHANGE CAVERN PRIORITIES.

 ENTER  CAVERN  PRIORITIES--
 l HIGHEST, 2 NEXT, ETC.

 ENTER PRIORITY FOR CAVERN 101
? 1
 ENTER PRIORITY FOR CAVERN 102
? 2
 SCHEDULING OPTIONS
        1.  DEVELOP SCHEDULE TO SITE COMPLETION
        2.  STOP SCHEDULE AFTER A NUMBER OF DAYS
              AND REPRIORITIZE THE CAVERNS

 ENTER NUMBER OF CHOICE
? 1

 SCHEDULING CONTINUING

**** SITE SCHEDULE COMPLETED ****
            SITE SCHEDULE IN FILE AUOUT


                          ********** MENU **********

    1.  EDIT OLD SITE FILE OR CREATE NEW SITE FILE USING EDITOR

    2.  DEVELOP INDIVIDUAL CAVERN SCHEDULES USING PREDICT
```

3. DEVELOP SITE SCHEDULES USING AUTSKED

4. EXIT FROM PROGRAM

ENTER NUMBER OF CHOICE
? 4
REVERT, SCHEDULE PROGRAM TERMINATED NORMALLY
/ra
15 FILES PROCESSED.
/list,f=preout

CAVERN 101 BREAKPOTNTS

DAY INTERVAL	LEACH STAGE	BRINE FLOW	OIL FLOW	CAVERN VOLUME	OIL VOLUME
0				0.	0.
1- 95	SUMP	50.0	.00	422.	0.
96- 103	SUMP	85.0	.00	470.	0.
104- 113	w/o				
114- 230	s/c	175.0	.00	2770.	0.
231- 240	W/O				
241- 370	R1	175.0	2.86	6094.	371.
371- 385	w/o				
386- 392	R2-1	175.0	.00	6280.	371.
393- 480	IDLE				
481- 605	R2-1	175.0	.00	9578.	371.
606- 727	R2-2	175.0	.00	12800.	371.
728- 742	w/o				
743- 806	FILL	175.0	175.00	12800.	11500.

CAVERN 102 BREAKPOINTS

DAY INTERVAL	LEACH STAGE	BRINE FLOW	OIL FLOW	CAVERN VOLUME	OIL VOLUME
0				0.	0.
1- 95	SUMP	50.0	.00	422.	0.
96- 138	SUMP	85.0	.00	679.	0.
139- 148	W/O				
149- 252	s/c	175.0	.00	2710.	0.
253- 262	w/o				
263- 394	RI	175.0	2.81	6092.	371.
395- 409	W/O				
410- 541	R2-1	175.0	.00	9578.	371.
542- 663	R2-2	175.0	.00	12800.	371.
664- 678	w/o				
679- 742	FILL	175.0	175.00	12800.	11500.

---SITE BREAKPOINTS---

DAY INTERVAL	TOTAL CAVERN VOLUME	TOTAL OIL VOLUME	DAILY OIL FLOW	BRINE PRODUCTION RATE
0	0.	0.		
1- 95	843.	0.	.00	100.0
96- 103	939.	0.	.00	170.0
104- 113	999.	0 .	.00	85.0
114- 138	1640.	0.	.00	260.0
139- 148	1837.	0.	.00	175.0
149- 230	5050.	0.	.00	350.0
231- 240	5246.	0.	.00	175.0
241- 252	5787.	34.	2.86	350.0
253- 262	6043.	63.	2.86	175.0
263- 370	11571.	675.	5.67	350.0
371- 385	11955.	717.	2.81	175.0
386- 392	12321.	737.	2.81	350.0
393- 394	12372.	743.	2.81	175.0
395- 409	12372.	743.	.oo	.0
410- 480	14247.	743.	.oo	175.0
481- 541	17467.	743.	.oo	350.0
542- 605	20846.	743.	.oo	350.0
606- 663	23910.	743.	.oo	350.0
664- 678	24306.	743.	.oo	175.0
679- 727	25600.	9263.	175.00	350.0
728- 742	25600.	11871.	175.00	175.0
743- 806	25600.	23000.	175.00	175.0

---SITE SUMMARY---

DAY	TOTAL CAVERN VOLUMES	TOTAL OIL VOLUMES	OIL USED	AVERAGE OIL FLOW
0	0.	0.		
90	799.	0.	0.	.00
180	3091.	0.	0.	.00
270	6452.	108.	108.	1.20
360	11059.	618.	510.	5.67
450	13455.	743.	124.	1.38
540	17415.	743.	0.	.oo
630	22167.	743.	0.	.oo
720	25415.	8046.	7303.	81.15
806	25600.	23000.	14954.	173.89

/list.f=auout

**** S C H E D U L E ****

MAXIMUM BRINE FLOW FOR SITE	1400 MB/DAY
MAXIMUM OIL FLOW FOR SITE	220 MB/DAY
MAXIMUM BRINE FLOW FOR CAVERN	175 MB/DAY
MAXIMUM OIL FLOW FOR CAVERN	175 MB/DAY
NUMBER OF WORKOVER RIGS	2

L E G E N D

su	SUMP
SC	SUMP/CHIMNEY
R1	REVERSE 1
R2	REVERSE 2
R3	REVERSE 3
F1	INTERMEDIATE FILL PHASE
F2	TNTERMEDIATE FILL PHASE
F3	FINAL FILL PHASE
LF	LEACH/FILL OIL FLOW
W1	WORKOVER PHASE 1
w2	WORKOVER PHASE 2
w3	WORKOVER PHASE 3
F	SOME CAVERN IN FILL PHASE

DATE	# DAYS	CAVERN NUMBER 101	102	
07/01/87	0	5osut	50SU+	+
CAVERN CLOCK		0+	0+	
10/04/87	95	85SU+	85SU+	+
CAVERN CLOCK		95+	95+	
10/12/87	103	W1 + su +		+
CAVERN CLOCK		103+	103+	
10/15/87	106	w2 + su +		+
CAVERN CLOCK		106+	106+	
10/19/87	110	w3 + su +		+
CAVERN CLOCK		110+	110+	
10/22/87	113	175SC+	s u +	+
CAVERN CLOCK		113+	113+	
11/16/87	138	SC + W1 +		+
CAVERN CLOCK		138+	138+	
11/19/87	141	SC + w2 +		+
CAVERN CLOCK		141+	141+	
11/23/87	145	SC + w3 +		+
CAVERN CLOCK		145+	145+	
11/26/87	148	SC +175SC+		+
CAVERN CLOCK		148+	148+	
11/28/87	150	SC + SC +		+
CAVERN CLOCK		150+	1 5 0 t	

02/16/88	230	W1 +	SC +			+
CAVERN	CLOCK	230+	230+			
02/19/88	233	w2 +	SC +			+
CAVERN	CLOCK	233+	233+			
02/23/88	237	w3 +	SC +			+
CAVERN	CLOCK	237+	237+			
02/26/88	240	172R1+	SC +		F	+
		3LF+	+			+
CAVERN	CLOCK	240+	240+			
03/09/88	252	R1 +	W1 +			+
CAVERN	CLOCK	252+	252+			
03/12/88	255	R1 +	W2 +			+
CAVERN	CLOCK	255+	255+			
03/16/88	259	R1 +	W3 +			+
CAVERN	CLOCK	259+	259+			
03/19/88	262	R1 +	172R1+		F	+
		+	3LF+			+
CAVERN	CLOCK	262+	262+			
07/07/88	372	W1 +	R1 +			+
CAVERN	CLOCK	372+	372+			
07/10/88	375	W1 +	R1 +			+
CAVERN	CLOCK	375+	375+			
07/12/88	377	W2 +	R1 +			+
CAVERN	CLOCK	377+	377+			
07/17/88	382	W3 +	R1 +			+
CAVERN	CLOCK	382+	382+			
07/22/88	387	175R2+	R1 +			+
CAVERN	CLOCK	387+	387+			
07/29/88	394	175R2+	R1 +			+
CAVERN	CLOCK	394+	394+			
07/31/88	396	R2 +	Wl +			+
CAVERN	CLOCK	396+	396+			
08/05/88	401	R2 +	W2 +			+
CAVERN	CLOCK	401+	401+			
08/10/88	406	R2 +	W3 +			+
CAVERN	CLOCK	406+	406+			
08/15/88	411	R2 +	175R2+			+
CAVERN	CLOCK	411+	411+			
10/25/88	482	175R2+	R2 +			+
CAVERN	CLOCK	482+	482+			
11/29/88	517	175R2+	R2 +			+
CAVERN	CLOCK	517+	517+			
12/25/88	543	R2 +	175R2+			+
CAVERN	CLOCK	543+	543+			
03/31/89	639	W1 +	R2 +			+
CAVERN	CLOCK	639+	639+			
04/05/89	644	W2 +	R2 +			+
CAVERN	CLOCK	644+	644+			
04/10/89	649	W3 +	R2 +			+
CAVERN	CLOCK	649+	649+			
04/15/89	654	175F2+	R2 +		F	+
CAVERN	CLOCK	654+	654+			
04/26/89	665	F2 +	Wl +		F	+
CAVERN	CLOCK	665+	665+			

```
05/01/89    670    F2 + W2 + F +
  CAVERN CLOCK     670+ 670+
05/06/89    675    F2 + W3 + F +
  CAVERN CLOCK     675+ 675+
05/11/89    680    F2 + 45F2+ F t
  CAVERN CLOCK     680+ 680t
06/18/89    718       +175F2+ F t
  CAVERN CLOCK     718+ 718+
08/11/89    772       t    t    t
  CAVERN CLOCK     718t 772+
```

STATISTICS FOR VARIABLES BASED ON OBSERVATION

	MEAN VALUE	STANDARD DEVIATION	COEFF. OF VARIATION	MINIMUM VALUE	MAXIMUM VALUE	NUMBER OF OBSERVATIONS
CAVERN DONE TIME	.7450E+03	.3818E+02	.5125E-01	.7180E+03	.7720E+03	2

STATISTICS FOR 'TIME-P'ENSISTENT VARIABLES

	MEAN VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	TIME INTEHVAL	CURRENT VALUE
If- FILL 1 ELSE 0	.3109E+00	.4629E+00	.0000E+00	.1000E+01	.7720E+03	.1000E+01

FILE 1 IS F1 OR F2 FILL QUEUE

FILE 3 IS F3 FILL QUEUE

FILE 4 IS LEACHING QUEUE

FILE 5 IS WORKOVER 1 OR 3 QUEUE

FILE 6 IS WORKOVER 2 QUEUE

```
      PRINTOUT OF FILE NUMBER 1
          TNOW =   .7720E+03
          QQTIM=   .7180E+03

TIME PERIOD FOR STATISTICS .7720E+03
AVERAGE NUMBER IN FILE          .0000
STANDARD  DEVIATION             . 0000
MAXIMUM NUMBER IN FILE        2

          THE FILE IS EMPTY


      PRINTOUT OF FILE NUMBER 3
          TNOW =   .7720E+03
          QQTIM=   .0000E+00

TIME PERIOD FOR STATISTICS  .7720E+03
AVERAGE NUMBER IN FILE          . 0000
STANDARD  DEVIATION             .0000
MAXIMUM NUMBER IN FILE        0

          THE FTLE IS EMPTY


      PRINTOUT OF FILE NUMBER 4
          TNOW =   .7720E+03
          QQTIM=   .6540E+03

TIME PERIOD FOR STATISTICS  .7720E+03
AVERAGE NUMBER IN FILE          . 0000
STANDARD  DEVIATION             .0000
MAXIMUM NUMBER IN FILE        2

          THE FILE IS EMPTY


      PRINTOUT OF FILE NUMBER 5
          TNOW =   .7720E+03
          QQTIM=   .6750E+03

TIME PERIOD FOR STATISTICS  .7720E+03
AVERAGE NUMBER IN FILE          .0000
STANDARD  DEVIATION             .0000
MAXIMUM NUMBER IN FILE        1

          THE FILE IS EMPTY


      PRINTOUT OF FILE NUMBER   6
          TNOW =   .7720E+03
          QQTIM=   .6700E+03
```

TIME PERIOD FOR STATISTICS .7720E+03
AVERAGE NUMBER IN FILE . 0000
STANDARD DEVIATION .0000
MAXIMUM NUMBER IN FILE 1

THE FILE IS EMPTY

RESOURCE STATISTICS

RESOURCE NUMBER	RESOURCE LABEL	CURRENT CAPACITY	AVERAGE UTILIZATION	STANDARD DEVIATION	MAXIMUM UTILIZATION	CURRENT UTILIZATION
1	BRINE	******	271981.8653	98266.1722	350000	0

RESOURCE STATISTICS

RESOURCE NUMBER	RESOURCE LABEL	CURRENT CAPACITY	AVERAGE UTILIZATION	STANDARD DEVTATION	MAXIMUM UTXLIZATION	CURRENT UTILIZATION
2	WO1 OR 3	3	.0829	.2757	1	0

RESOURCE STATISTICS

RESOURCE NUMBER	RESOURCE LABEL	CURRENT CAPACITY	AVERAGE UTILIZATION	STANDARD DEVIATION	MAXIMUM UTILIZATION	CURRENT UTILIZATION
3	wo2	2	.0466	.2108	1	0

RESOURCE STATISTICS

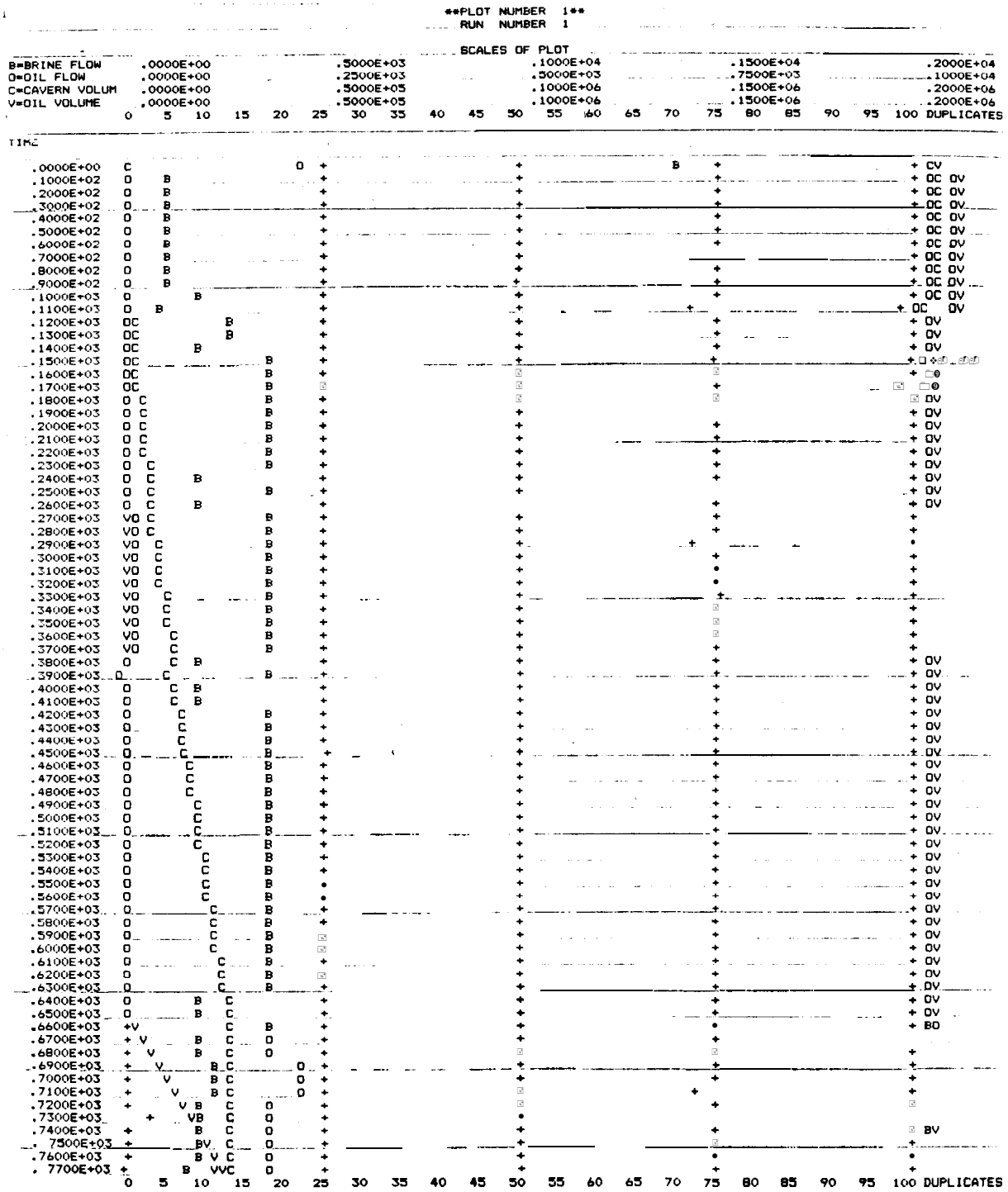
RESOURCE NUMBER	RESOURCE LABEL	CURRENT CAPACITY	AVERAGE UTILIZATION	STANDARD DEVIATION	MAXIMUM UTXLIZATION	CURRENT UTILIZATION
4	OIL	220000	29924.6528	68303.5158	220000	0

1 **TABLE NUMBER 1**
RUN NUMBER 1

TIME	BRINE FLOW	OIL FLOW	CAVERN VOLUME	OIL VOLUME
.0000E+00	.1400E+04	.2200E+03	.0000E+00	.0000E+00
.1000E+02	.1000E+03	.0000E+00	.8874E+02	.0000E+00

.2000E+02	.1000E+03	.0000E+00	.1775E+03	.0000E+00
.3000E+02	.1000E+03	.0000E+00	.2662E+03	.0000E+00
.4000E+02	.1000E+03	.0000E+00	.3550E+03	.0000E+00
.5000E+02	.1000E+03	.0000E+00	.4437E+03	.0000E+00
.6000E+02	.1000E+03	.0000E+00	.5324E+03	.0000E+00
.7000E+02	.1000E+03	.0000E+00	.6212E+03	.0000E+00
.8000E+02	.1000E+03	.0000E+00	.7099E+03	.0000E+00
.9000E+02	.1000E+03	.0000E+00	.7986E+03	.0000E+00
.1000E+03	.1700E+03	.0000E+00	.9037E+03	.0000E+00
.1100E+03	.8500E+02	.0000E+00	.9825E+03	.0000E+00
.1200E+03	.2600E+03	.0000E+00	.1181E+04	.0000E+00
.1300E+03	.2600E+03	.0000E+00	.1439E+04	.0000E+00
.1400E+03	.1750E+03	.0000E+00	.1685E+04	.0000E+00
.1500E+03	.3500E+03	.0000E+00	.1921E+04	.0000E+00
.1600E+03	.3500E+03	.0000E+00	.2315E+04	.0000E+00
.1700E+03	.3500E+03	.0000E+00	.2710E+04	.0000E+00
.1800E+03	.3500E+03	.0000E+00	.3104E+04	.0000E+00
.1900E+03	.3500E+03	.0000E+00	.3498E+04	.0000Et00
.2000E+03	.3500E+03	.0000E+00	.3892E+04	.0000E+00
.2100E+03	.3500E+03	.0000E+00	.4287E+04	.0000E+00
.2200E+03	.3500E+03	.0000E+00	.4681E+04	.0000E+00
.2300E+03	.3500E+03	.0000E+00	.5075E+04	.0000E+00
.2400E+03	.1750E+03	.0000E+00	.5272E+04	.0000E+00
.2500E+03	.3500E+03	.2810E+01	.5722E+04	.2810E+02
.2600E+03	.1750E+03	.2810E+01	.6014E+04	.5620E+02
.2700E+03	.3500E+03	.5578E+01	.6469E+04	.1064E+03
.2800E+03	.3500E+03	.5578E+01	.6975E+04	.1622E+03
.2900E+03	.3500E+03	.5578E+01	.7480E+04	.2180E+03
.3000E+03	.3500E+03	.5578E+01	.7986E+04	.2738E+03
.3100E+03	.3500E+03	.5578E+01	.8492E+04	.3296E+03
.3200E+03	.3500E+03	.5578E+01	.8997E+04	.3853E+03
.3300E+03	.3500E+03	.5578E+01	.9503E+04	.4411E+03
.3400E+03	.3500E+03	.5578E+01	.1001E+05	.4969E+03
.3500E+03	.3500E+03	.5578E+01	.1051E+05	.5527E+03
.3600E+03	.3500E+03	.5578E+01	.1102E+05	.6085E+03
.3700E+03	.3500E+03	.5578E+01	.1152E+05	.6642E+03
.3800E+03	.1750E+03	.2768E+01	.1183E+05	.6975E+03
.3900E+03	.3500E+03	.2768E+01	.1216E+05	.7252E+03
.4000E+03	.1750E+03	.0000E+00	.1258E+05	.7418E+03
.4100E+03	.1750E+03	.0000E+00	.1284E+05	.7418E+03
.4200E+03	.3500E+03	.0000E+00	.1335E+05	.7418E+03
.4300E+03	.3500E+03	.0000E+00	.1388E+05	.7418E+03
.4400E+03	.3500E+03	.0000E+00	.1441E+05	.7418E+03
.4500E+03	.3500E+03	.0000E+00	.1494E+05	.7418E+03
.4600E+03	.3500E+03	.0000E+00	.1547E+05	.7418E+03
.4700E+03	.3500E+03	.0000E+00	.1601E+05	.7418E+03
.4800E+03	.3500E+03	.0000E+00	.1654E+05	.7418E+03
.4900E+03	.3500E+03	.0000E+00	.1707E+05	.7418E+03
.5000E+03	.3500E+03	.0000E+00	.1760E+05	.7418E+03
.5100E+03	.3500E+03	.0000E+00	.1813E+05	.7418E+03
.5200E+03	.3500E+03	.0000E+00	.1866E+05	.7418E+03
.5300E+03	.3500E+03	.0000E+00	.1920E+05	.7418E+03
.5400E+03	.3500E+03	.0000E+00	.1973E+05	.7418E+03
.5500E+03	.3500E+03	.0000E+00	.2026E+05	.7418E+03
.5600E+03	.3500E+03	.0000E+00	.2079E+05	.7418E+03

.5700E+03	.3500E+03	.0000E+00	.2132E+05	.7418E+03
.5800E+03	.3500E+03	.0000E+00	.2185E+05	.7418E+03
.5900E+03	.3500E+03	.0000E+00	.2238E+05	.7418E+03
.6000E+03	.3500E+03	.0000E+00	.2292E+05	.7418E+03
.6100E+03	.3500E+03	.0000E+00	.2345E+05	.7418E+03
.6200E+03	.3500E+03	.0000E+00	.2398E+05	.7418E+03
.6300E+03	.3500E+03	.0000E+00	.2451E+05	.7418E+03
.6400E+03	.1750E+03	.0000E+00	.2501E+05	.7418E+03
.6500E+03	.1750E+03	.0000E+00	.2528E+05	.7418E+03
.6600E+03	.3500E+03	.1750E+03	.2555E+05	.1792E+04
.6700E+03	.1750E+03	.1750E+03	.2568E+05	.3542E+04
.6800E+03	.1750E+03	.1750E+03	.2568E+05	.5292E+04
.6900E+03	.2200E+03	.2200E+03	.2568E+05	.7492E+04
.7000E+03	.2200E+03	.2200E+03	.2568E+05	.9692E+04
.7100E+03	.2200E+03	.2200E+03	.2568E+05	.1189E+05
.7200E+03	.1750E+03	.1750E+03	.2568E+05	.1400E+05
.7300E+03	.1750E+03	.1750E+03	.2568E+05	.1575E+05
.7400E+03	.1750E+03	.1750E+03	.2568E+05	.1750E+05
.7500E+03	.1750E+03	.1750E+03	.2568E+05	.1925E+05
.7600E+03	.1750E+03	.1750E+03	.2568E+05	.2100E+05
.7700E+03	.1750E+03	.1750E+03	.2568E+05	.2275E+05
.7720E+03	.1750E+03	.1750E+03	.2568E+05	.2310E+05
MINIMUM	.8500E+02	.0000E+00	.0000E+00	.0000Et00
MAXIMUM	.1400E+04	.2200E+03	.2568E+05	.2310E+05


PLOT NUMBER 1
RUN NUMBER 1
SCALES OF PLOT
B=BRINE FLOW .0000E+00 .5000E+03 .1000E+04 .1500E+04 .2000E+04
O=OIL FLOW .0000E+00 .2500E+03 .5000E+03 .7500E+03 .1000E+04
C=CAVERN VOLUM .0000E+00 .5000E+05 .1000E+06 .1500E+06 .2000E+06
V=OIL VOLUME .0000E+00 .5000E+05 .1000E+06 .1500E+06 .2000E+06
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 DUPLICATES
TIME
TIME

OUTPUT CONSISTS OF 79 F'OINT SETS (516 POINTS)

**** V O L U M E S ****

AVERN#	101		102		SITE TOTALS	
DAYS	CAVERN	OIL	CAVERN	OIL	CAVERN	OIL
0	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.000000E+00	.000000E+00
75	.42150E+03	.00000E+00	.42150E+03	.00000E+00	.843010E+03	.000000E+00
103	.47002E+03	.00000E+00	.47002E+03	.00000E+00	.940040E+03	.000000E+00
106	.47002E+03	.00000E+00	.43841E+03	.00000E+00	.958230E+03	.000000E+00
110	.47002E+03	.00000E+00	.51247E+03	.00000E+00	.982490E+03	.000000E+00
113	.47002E+03	.00000E+00	.53066E+03	.00000E+00	.100070E+04	.000000E+00
138	.96284E+03	.00000E+00	.68227E+03	.00000E+00	.164510E+04	.000000E+00
141	.10220E+04	.00000E+00	.68227E+03	.00000E+00	.170420E+04	.000000E+00
145	.11008E+04	.00000E+00	.68227E+03	.00000E+00	.178310E+04	.000000E+00
148	.11600E+04	.00000E+00	.68227E+03	.00000E+00	.184220E+04	.000000E+00
150	.11994E+04	.00000E+00	.72170E+03	.00000E+00	.192110E+04	.000000E+00
230	.27764E+04	.00000E+00	.22987E+04	.00000E+00	.507510E+04	.000000E+00
233	.27764E+04	.00000E+00	.23578E+04	.00000E+00	.513420E+04	.000000E+00
237	.27764E+04	.00000E+00	.24367E+04	.00000E+00	.521310E+04	.000000E+00
240	.27764E+04	.00000E+00	.24958E+04	.00000E+00	.527220E+04	.000000E+00
252	.30797E+04	.33720E+02	.27324E+04	.00000E+00	.581210E+04	.337200E+02
255	.31555E+04	.42150E+02	.27324E+04	.00000E+00	.588790E+04	.421500E+02
259	.32566E+04	.53390E+02	.27324E+04	.00000E+00	.598900E+04	.533900E+02
262	.33325E+04	.61820E+02	.27324E+04	.00000E+00	.606480E+04	.618200E+02
372	.61127E+04	.37092E+03	.55132E+04	.30448E+03	.116260E+05	.675400E+03
375	.61127E+04	.37092E+03	.55891E+04	.31278E+03	.117020E+05	.683700E+03
377	.61127E+04	.37092E+03	.56396E+04	.31832E+03	.117520E+05	.689240E+03
382	.51127E+04	.37092E+03	.57661E+04	.33216E+03	.118790E+05	.703080E+03
387	.61127E+04	.37092E+03	.58925E+04	.34600E+03	.120050E+05	.716920E+03
394	.62987E+04	.37092E+03	.60694E+04	.36538E+03	.123680E+05	.736300E+03
396	.63519E+04	.37092E+03	.61200E+04	.37091E+03	.124720E+05	.741830E+03
401	.64848E+04	.37092E+03	.61200E+04	.37091E+03	.126050E+05	.741830E+03
406	.66176E+04	.37092E+03	.61200E+04	.37091E+03	.127380E+05	.741830E+03
411	.67505E+04	.37092E+03	.61200E+04	.37091E+03	.128700E+05	.741830E+03
482	.86372E+04	.37092E+03	.80067E+04	.37091E+03	.166440E+05	.741830E+03
517	.95673E+04	.37092E+03	.89368E+04	.37091E+03	.185040E+05	.741830E+03
543	.10258E+05	.37092E+03	.96277E+04	.37091E+03	.198860E+05	.741830E+03
639	.12809E+05	.37092E+03	.12179E+05	.37091E+03	.249880E+05	.741830E+03
644	.12809E+05	.37092E+03	.12312E+05	.37091E+03	.251210E+05	.741830E+03
649	.12809E+05	.37092E+03	.12445E+05	.37091E+03	.252540E+05	.741830E+03
654	.12809E+05	.37092E+03	.12577E+05	.37091E+03	.253870E+05	.741830E+03
665	.12809E+05	.22959E+04	.12870E+05	.37091E+03	.256790E+05	.266680E+04
670	.12809E+05	.31709E+04	.12870E+05	.37091E+03	.256790E+05	.354180E+04
675	.12809E+05	.40459E+04	.12870E+05	.37091E+03	.256790E+05	.441680E+04
680	.12809E+05	.49209E+04	.12870E+05	.37091E+03	.256790E+05	.529180E+04
718	.12809E+05	.11571E+05	.12870E+05	.20809E+04	.256790E+05	.136520E+05
772	.12809E+05	.11571E+05	.12870E+05	.11531E+05	.256790E+05	.231020E+05

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